

Blackbird-Millington Corridor Conservation Area Plan

Riparian Corridors

Target Description

Riparian Corridors include streams and the associated habitat along them -- in the Corridor these include all of the Blackbird Creek as well as headwaters of the Cypress Branch and small segments of headwater streams for the Sassafras River (to the northwest) and Duck Creek and the Delaware Bay (to the southeast), and habitats along them. In total, there are over one million feet of streams in the Corridor. For the purpose of our conservation targets and associated analysis, the stream corridors of Blackbird Creek (west of Beaver Branch) Cypress Branch are the primary targets. (Map U.)



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The most detailed characterization we have for Corridor streams comes from the Delaware National Estuarine Research Reserve site on the eastern portion of Blackbird Creek (east of Route 1 and 13) in the transition zone between Tidal Wetlands and Riparian Corridor. In that area, the Blackbird Creek channel ranges from 246 to 361 feet in width with expansive mud flats at low tides and large areas of open water during high tide. Current velocity ranges from 1.6 to 2.3 feet per second at mid-channel and mid-depth.¹ The Maryland DNR and the Chester River Watershed Association are in the process of completing a stream characterization for the Upper Chester, which includes the Maryland portion of Cypress Branch. These results will presumably provide more information about that stream system.

113 plant species have been found at the Delaware National Estuarine Research Reserve at Blackbird Creek, including four species of conservation concern: marsh marigold, rough avens, Canada lily, and nodding bur-marigold. Another plant species of concern -- swamp milkweed -- is known to occur in the area but has not been found for some time.² Significant plant species detected by Natural Heritage Program surveys along streams to the west, in the Blackbird State Forest, include: brome-like sedge, inflated sedge, buxbaum's sedge and straw sedge.

Wildlife species that rely specifically on riparian corridor habitat include neotropical migratory songbirds (breeding and stopover), odonates (dragonflies and damselflies), and freshwater mussels. Figure 13 (in the *Tidal Wetlands and Waters* section) provides a summary of wildlife species found at the Delaware National Estuarine Research Reserve site. Natural Heritage Program surveys along Blackbird Creek to the west, in the Blackbird State Forest, noted two significant species of freshwater mussels (indicators of water quality): the alewife floater and the eastern elliptio. These surveys also noted a high diversity of odonates in streamside areas, 45 total, including 11 of concern, four of which are notable: harlequin darner, sable clubtail, bar-winged skimmer, and double-ringed pennant.³ For one

¹ Delaware Department of Natural Resources and Environmental Control, Delaware National Estuarine Research Reserve (DNERR). 1999. *Delaware National Estuarine Research Reserve Estuarine Profiles*. Delaware Department of Natural Resources, Delaware National Estuarine Research Reserve, 818 Kitts Hummock Rd., Dover, DE.

² DNERR 1999.

³ Bowman, Peter J., and Christopher M. Heckscher, William A. McAvoy, and Eric F. Zuelke. 2001. Biological Surveys at Blackbird State Forest: 2000 Progress Report. Delaware Natural Heritage Program, Delaware Division of Fish and Wildlife, 4876 Hay Point Landing Road, Smyrna, DE.

of these species – the sable clubtail – the Corridor is the only place it is known to occur on the Delmarva Peninsula.⁴

Figure 24.5 is a list of fish species caught in the Blackbird Creek during 2001, 2002, and 2003, as recorded by the DNREC Division of Fish and Wildlife, Fisheries.⁵

Figure 24.5
Fish Caught in Blackbird Creek: 2001-2003*

alewife	bluegill	silvery minnow
American eel	brown bullhead	spot
Atlantic croaker	carp	spottail shiner
Atlantic herring	channel catfish	striped bass
Atlantic menhaden	gizzard shad	summer flounder
Atlantic silverside	golden shiner	tessellated darter
banded killifish	hogchoker	weakfish
bay anchovy	mummichog	white catfish
black crappie	naked goby	white perch
black drum	northern kingfish	
blueblack herring	northern pipefish	
bluefish	pumpkinseed	

**Domant species in bold*

Indicators of Healthy Riparian Corridors

The three key attributes selected as those most important to sustained riparian corridor health are natural flow regime (as indicated by the absence of obstructions or alterations and the amount of impervious surfacing in the watershed), water quality (as indicated by the amount of impervious surfacing in the watershed, water chemistry, and the presence of 100 meter forested buffers), and characteristic ecological community, composition, distribution, and extent (as indicated by the presence of 300 meter forested buffers). The analysis surrounding each of these attributes and their indicators is presented below.

Absence of Obstructions/Alterations: An Indicator of Altered Stream Flow Regime

One of the key ecological attributes identified by scientists for riparian corridors in the Corridor is flow regime -- the extent to which natural stream flow is unimpeded. The indicator selected to measure this attribute is the absence of obstructions or alterations to flow, primarily ditches or dams. Corridor scientists developed the thresholds show in Figure 25 for flow regime.

Figure 25
Obstructions/Alterations Indicator Ratings:
Poor: <65% of stream systems without ditches or dams
Fair: 65-79% of stream systems without ditches or dams
Good: 80-99% of stream systems without ditches or dams
Very Good: 100% of stream systems without ditches or dams

⁴ Email communication with Hal White, University of Delaware, March 2004.

⁵ Email communication with John Clark, DNREC Division of Fish & Wildlife, Fisheries Section, December 2004.

The extent of obstructions or alterations on streams in the Corridor was estimated to be minimal based on the examination of aeriels and Corridor scientists' general knowledge of the area, rating the Corridor "Good". According to Jim Dobson, Blackbird State Forest, there are only three tax ditches in the area. However, preliminary examination of information from the State of Delaware Drainage Division indicates that ditching in the Corridor as a whole may more.⁶ (The state is in the process of revising their ditch layer; it was not available to us at the time of this report.)

The extent to which these ditches are being maintained and are impacting stream flows is unknown and needs to be investigated via surveying, and Corridor ratings adjusted accordingly.

Impervious Surfacing: An Indicator of Altered Stream Flow Regime and Water Quality

A second indicator was used as a measure for flow regime: impervious surfacing. The logic behind this selection is the same logic behind the selection of this indicator for hydrologic regime for wetlands: The more rainwater runs off of hard surfaces directly into streams and wetlands, the less water is filtered through the ground and back into the streams and shallow aquifers, the more pollutants end up in streams and wetlands, and the greater local flooding and stream-channel erosion. In fact, the same exact analysis was used to determine thresholds and rate Corridor conditions, as was used for the tidal wetlands and waters analysis.

Impervious surfacing was also used as an indicator for water quality, since greater areas of impervious surface result in more pollution running off into streams. Again the same exact analysis and results -- "Good" -- were used as those presented in the section on *Tidal Wetlands and Waters*. See Page 42 for a full explanation of the analysis and results.

300-Meter (928 feet) Wide Forested Stream Corridors: An Indicator of Characteristic Ecological Community, Composition, Distribution, and/or Extent for Riparian Corridors

Studies in the Mid-Atlantic states have shown that forested habitat along riparian corridors provides key migratory bird stopover habitat.⁷ These and other studies provide a great deal of information about the widths of riparian buffers necessary to

Figure 26

300-Meter Forested Corridor Indicator Ratings:

Poor: <50% of riparian corridor with 300m forested width

Fair: 50-75% of riparian corridor with 300m forested width

Good: 75-90% of riparian corridor with 300m forested width

Very Good: 90-100% of riparian corridor with 300m forested width

⁶ Preliminary information (graphic only; no data) provided by John E. Inkster, Senior Application Support Specialist, Division of Soil & Water Conservation Drainage Section, DNREC, Georgetown, DE.

⁷ Keller, C.M.E., C.S. Robbins, and J.S. Hatfield. 1993. Avian communities in riparian forests of different widths in Maryland and Delaware. *Wetlands*, Vol. 13, No. 2: 137-144;

sustain certain bird species.^{8 9} Based on these studies, Corridor scientists identified a 300 meter (928 feet) wide forested corridor (that includes both sides of the stream; 150 meters -- 492 feet -- on both sides) as the width sufficient to provide forest interior habitat for a large percentage of area sensitive birds and decrease threat of predation. Corridor scientists developed the thresholds in Figure 26 based on this information.

The TNC GIS intern used GIS analysis to build buffers onto Blackbird Creek and Cypress Branch (492 feet on both sides) and calculate how much of those buffers were forested. Results indicate 11,137 acres of buffer area, of which 7,272 acres is forested, for a total of 65.3% forested - "Fair" according to thresholds. These results can be visualized by looking at Map U, which shows standard 100-meter buffers (328 feet) on both sides of Blackbird Creek and Cypress Branch and its tributaries in the Corridor.¹⁰

100-Meter (328 feet) Wide Forested Stream Corridors: An Indicator of Water Quality

Water quality -- including sedimentation, turbidity, nutrients, water temperature, and dissolved oxygen - was identified by Corridor scientists as another key factor in riparian corridor habitat health. Studies have shown that 50 meter (164 foot) forested buffers on either side (100 meters total both sides) of river systems intercept the majority of sediments and nutrients before they reach the system.¹¹ Based on this information, Corridor scientists developed a second set of thresholds for forested buffers along streams, specifically for protecting water quality (Figure 27).

Using the same methodology described above, The TNC GIS intern built buffers onto Blackbird Creek and Cypress Branch (164 feet on both sides) and identified how much of those buffers were forested. Results indicate 3,791 acres of buffer area, of which 3,177 acres is forested, for a total of 83% forested - "Good" according to thresholds. This buffer area can be visualized by looking at Map U, which shows standard 100-meter buffers (328 feet) on both sides of Blackbird Creek and Cypress Branch and its tributaries in the Corridor.¹²

Figure 27

100-Meter Forested Corridor Indicator Ratings:

Poor: <50% of riparian corridor with 100 m forested width

Fair: 50-80% of riparian corridor with +100 m forested width

Good: 80-95% riparian corridor with 100m forested width

Very Good: 95-100% of riparian corridor with 100m forested width

⁸ Kilgo, J.C., R.A. Sargent, B.R. Chapman, and K.V. Miller. 1998. Effect of stand width and adjacent habitat on breeding bird communities in bottomland hardwoods. *Journal of Wildlife Management* 62(1): 72-83.

⁹ Vander Haegen, W.Wm., and R.M. DeGraaf. 1996. Predation on artificial nests in forested riparian buffer strips. *Journal of Wildlife Management* 60: 542-550.

¹⁰ The buffer calculations described in this report were completed before the decision was made to focus just on Blackbird Creek and Cypress Branch and its tributaries, and does include some tributaries of the Sassafrass; the calculations shown

¹¹ Environmental Law Institute. 2003. *Protecting Delaware's Forests for Biodiversity* (also Waenger 1999 and Desbisset et al 1994 were cited as sources by Core Science team members for this measure.)

¹² The buffer calculations described in this report were completed before the decision was made to focus just on Blackbird Creek and Cypress Branch and its tributaries, and does include some tributaries of the Sassafrass.

MORE About Buffers...

For water quality purposes, 50-meter buffers along stream banks forming a forested corridor 100 meters wide (about 300 feet) is sufficient for water quality purposes. However, the optimal forested stream corridor for wildlife habitat is 300 meters wide – the equivalent of 150 meter buffers (or almost 500 feet) on each side. For communicating with landowners and the community about the need for buffers, these two measures were boiled down into one: 300-foot buffers from stream edges on both sides forming total forested corridors 600 feet in width. Of course, implementing the truly appropriate buffer for any specific streamside or wetland-side area will be determined case-by-case, based on the property's features and the landowner's needs and goals, starting with the standard 300-foot buffer and using the more specific requirements presented in this report as guides for adjusting buffer size as needed for different features, and for monitoring changes to target viability over time.

Water Chemistry: An Indicator of Water Quality

Corridor scientists identified a second indicator for measuring water quality: water chemistry. Parameters for water chemistry were developed based on the standards used by state regulating agencies to characterize surface water quality for "aquatic life use", as required by the Environmental Protection Agency (Figure 28).

According to the *DNREC 2002 Watershed Assessment Report*, Lower Blackbird Creek (13.8 miles, east of Route 1) does not support aquatic life use, based on dissolved oxygen, temperature, and nutrients (phosphorous, nitrogen, chlorophyll), Upper Blackbird Creek (13.6 miles, west of Route 1) partially supports aquatic life use (based on the same factors), and Cypress Branch (12.2 miles in Delaware) does not support aquatic life use (based on the same factors).¹³ Per the *Maryland Clean Water Action Plan*, the Chester River watershed is classified as a Priority 1 watershed, indicating that it does not meet clean water or natural resources goals and is included in the states' EPA 303(d) list of impaired waters.¹⁴ The Maryland portion of Cypress Branch is part of this watershed (approximately 12 miles.)

Figure 28

Water Chemistry Indicators Ratings:

Poor: <50% of rivers and streams meet water quality standards for aquatic life

Fair: 50-75% of rivers and streams meet water quality standards for aquatic life

Good: 75-90% of rivers and streams meet water quality standards for aquatic life

Very Good: > 90% of rivers and streams meet water quality standards for aquatic life

Based on these results, about 30% of rivers and streams in the Corridor (Upper Blackbird Creek) partially support aquatic life use - a rating of "Poor" according to thresholds.

Threats to Healthy Riparian Corridors

Stresses to riparian corridors include stresses to water quality such as reduced dissolved oxygen, elevated nutrient inputs, increased water temperature, sedimentation, road run-off, and pesticides. They also include increased flow rates at pulse events due to increased runoff from impervious surfacing and alterations to flow from obstructions like dams, improperly set culverts, ditch drainage systems and

¹³ Delaware Department of Natural Resources and Environmental Control. 2002. *State of Delaware 2002 Watershed Assessment Report (305(b))*. Dover, DE.

¹⁴ Clean Water Action Plan Technical Working Group. 1998. *Maryland Clean Water Action Plan: Final 1998 Report on Unified Watershed Assessment, Watershed Prioritization and Plans for Restoration Action Strategies*. Annapolis, MD.

more. Characteristic ecological community composition/distribution/extent is impacted by lack/losses of coastal forests adjacent to river systems and along stream banks, as well as by invasive species.

Figure 29 below summarizes the evaluation of the six primary sources of stress to stream corridors.

Figure 29

Threats - Sources of Stress			water quality	Flow regime	Characteristic ecological community composition/distribution/extent	Threat to System Rank
Riparian corridors			Medium	Medium	Medium	
1	Loss of natural upland buffer to agriculture	Contribution	Very High	High	Very High	Medium
		Irreversibility	Low	Low	Medium	
		Override				
		Source	High	Medium	High	
		Combined Rank	Medium	Low	Medium	
2	Incompatible agricultural practices	Contribution	Medium	Medium	Low	Low
		Irreversibility	Low	Low	Low	
		Override				
		Source	Low	Low	Low	
		Combined Rank	Low	Low	Low	
3	Loss of natural upland buffer to residential development	Contribution	High	High	High	Medium
		Irreversibility	Very High	Very High	Very High	
		Override				
		Source	High	High	High	
		Combined Rank	Medium	Medium	Medium	
4	Invasive/alien species	Contribution			Low	Low
		Irreversibility			High	
		Override				
		Source	-	-	Medium	
		Combined Rank	-	-	Low	
5	Road construction/upgrades	Contribution	Medium	Medium	Medium	Low
		Irreversibility	High	High	High	
		Override				
		Source	Medium	Medium	Medium	
		Combined Rank	Low	Low	Low	
6	Residential/commercial development	Contribution	Medium	Medium	Medium	Low
		Irreversibility	Medium	High	High	
		Override				
		Source	Medium	Medium	Medium	
		Combined Rank	Low	Low	Low	

There were no “high”-ranking sources of stress identified for riparian corridors. However, the loss of upland (forested) buffer is twice ranked “medium” – once for buffer loss to agriculture, and once for buffer loss from residential development. The loss of forested areas buffering streams impacts both water quality and habitat and is clearly the top threat to riparian corridors.

Incompatible agricultural practices (including ditching, irrigation, and poor grazing practices), invasive non-native species, road construction/upgrades, and residential/commercial development are lesser stresses to Riparian Corridors. In this case, residential/commercial development includes a host of poor management practices during the development process, or by homeowners afterward, that affect the flow or quality of water in streams. These include clearing understory, poor stormwater control, over-application of lawn chemicals, disposal of debris into the river system, and short-term sedimentation caused by clearing and building.